(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 205 173 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
15.05.2002 Bulletin 2002/20

(51) Int Cl.[7]: **A61J 1/00**

(21) Application number: **01126279.7**

(22) Date of filing: **06.11.2001**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **08.11.2000 US 246635 P**

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(54) Safety device for a syringe assembly

(57) A syringe safety device (10) forms a fluid coupling between a sealed vial (14) and a syringe (24) and includes a tubular connector (18) having a first axial open end (18a) engaging the end of the vial (12) and a second, opposing open axial end (18b) releasably receiving a syringe (24) to use with the vial (12), the tubular connector (18) enclosing a sliding joint (22) having opposing axial ends (22a, 22b) and a passageway (56) between the ends, a first axial end (22a) configured to engage an enlarged, blunt mounting end (20b) of a syringe needle (20), a second axial end (22b) configured to releasably engage at least a releasable needle receiver (30) on a distal end (32) of the syringe (24) without needle, the syringe (24) without needle being releasably removable from the sliding joint (22) after fluid coupling with the vial (14) through the passageway (56) of the sliding joint (22), without removal of the sliding joint (22) from the connector (18). The needle (20) is captured in the connector (18) with the sliding joint (22).

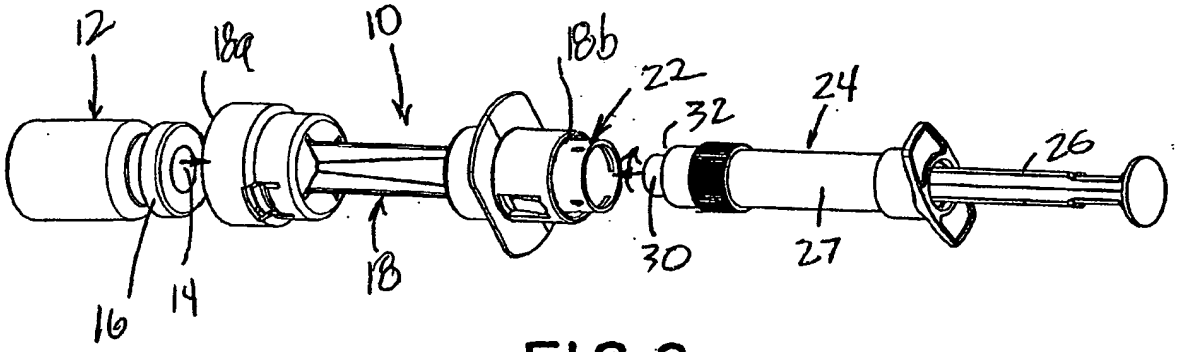

FIG. 2

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Description

BACKGROUND OF THE INVENTION

[0001] This invention is directed to a syringe safety device and, more specifically, to a syringe device that allows a user to reconstitute medicine in sealed vials without risk of the user being stuck by a needle needed to access the contents of the vial. It is often desirable to store drugs in a concentrated or powdered (e.g., lyophilized) form until just prior to administering the drug to a patient at which time the medicine is mixed with a solvent of diluent or rehydrant. Several different arrangements for mixing such drugs and liquids have been disclosed.

[0002] U.S. Patent No. 5,653,698 discloses a safety coupling system for reconstituting medications that employ a special tubular coupling (10) having a hub (20) containing a shielded needle cannula (12). The coupling system (10) can be joined with a special syringe that receives a special medication containing cartridge (40). The opposing end of the hub can be provided with Luer threads or can be designed to mate with an adapter in the form of a "pre-slit injection site" (72), which is threaded to be mounted on a tubular receiver. The requirement for use with a special cartridge containing syringe limits its broad utility. Also, the cannula, which has a smooth uniform outside diameter must be absolutely secured against sliding movement with respect to the hub or the cannula will be pushed from the hub when the syringe is pressed into its fluid coupling position in the proximal end (22) of the first sleeve (30) of the hub (20).

[0003] U.S. Patent No. 5,827,262 discloses another device for coupling together a conventional syringe and a medicament containing vial. A number of embodiments are disclosed but vary only slightly in detail. Each embodiment includes a tubular guide (e.g., 14) designed to receive a conventional vial at one end and a conventional syringe at the opposing end. The tubular guide (14) directs the needle (34) of a conventional syringe (12) into contact with of the stopper (22) of the vial (10) by providing a tubular slide member (48) which receives a distal end of the syringe and slidingly supports the distal end of the syringe as the needle of the syringe passes through a penetrable barrier (40) or small diameter opening in the center of the guide tube. All embodiments are designed to release the syringe with its needle after a medicament has been drawn into the syringe from the vial. Thus, there is always a possibility of a needle stick.

[0004] U.S. Patent No. 6,019,750 discloses a tubular connector device (10) that is designed to fluidly couple a conventional medicinal vial with piercable stopper and a flexible solution container or bag of the type having an injection port in the form of a separate tube extending from the bag and having its end sealed with a piercable stopper or other penetrable septum. The device (10) has first and second sleeves or tubes (30, 32), which are telescopically coupled together and which contain a double ended piercing member (34) or cannula. The device (10) further includes a foil (58) and a sealing member (103) in the two sleeves (32, 34) to seal the cannula (34) within the extended sleeves before use. In use, the sleeves (30, 32) are compressed together. One pointed end of the cannula within the second sleeve (32) is moved to the distal end of the sleeve in a position where it can pierce the stopper of a vial. The distal end of the first sleeve (30) has an annular gap between the sidewall of the sleeve and the cannula (34) to receive the tubular port (20) of the flexible bag (12) and to pierce the septum (22) located in the distal end of that port (20). The distal end (82) of the second tube (32) has an enlarged cavity (86) with plural spring fingers (84a) to secure the end of a vial (14) so that the vial could not normally be removed once attached without visible damage to the fingers (84a). The device also includes locking elements (50, 144, 146) to prevent the sleeves from being re-extended once they are compressed into the activated state. The same means prevent relative rotational movement of the sleeves with respect to one another in the activated state.

[0005] The U.S. Patent No. 6,019,750 connector is designed to attach a medicinal vial (14) to a flexible fluid bag (12) for dilution and requires that once the vial is attached to the bag and in communication with the fluid in the bag, the bag must be squeezed to deliver fluid to the interior of the vial. Then the bag, the connector and the vial all shaken together to mix the original vial contents with the added liquid in the bag. The bag is then again manipulated and re-squeezed to force compressed air into the vial so that when the bag is released from compression and the vial held upside down over the bag, its fluid contents will leak through the cannula into the bag. All three devices should again be shaken to fully mix the reconstituted medication with the remaining fluid in the bag. Such a mode of operation is not always convenient. If the caregiver has time to attach the connector and vial to the fluid bag before the bag is connected to the patient, such manipulation and agitation can take place away from the patient without disturbing the patient. However, that is not always possible. The drug may have to be given to the patent while the patient is already connected with the bag. Agitation of the bag and vial at that can be disturbing to the patient and can sometimes result in separation of the catheter tube from the needle connecting the bag to the patient or of the catheter needle from the patient.

[0006] It would be desirable to provide a similar safety device which permits mixing of hazardous ingredients in a stoppered vial with the contents of a fluid bag without exposing the user to the possibility of a needle stick and yet minimizes the manipulation of the bag.

SUMMARY OF THE INVENTION

[0007] The invention is a syringe safety device (10)

configured to form a fluid coupling between a sealed vial (14) and a syringe (24), the syringe safety device (10) including a tubular connector (18) having a first axial open end (18a) configured to engage the end of a conventional medicine vial (12) with stopper (14) and a second, opposing open axial end (18b) adapted to releasably receive a conventional syringe for sliding movement of the syringe in the tubular connector (18) towards and away from the vial (12), characterized in the tubular connector (18) enclosing a sliding joint (22) having opposing first and second axial ends (22a, 22b),and a passageway (56) between the first and second ends (22a, 22b), the first axial end (22a) being configured to engage with an enlarged, blunt mounting end (20b) of a syringe needle (20), the second axial end (22b) of the sliding joint (22) further being configured to releasably engage at least a releasable needle receiver (30) on a distal end (32) of a barrel (27) of a conventional syringe (24) without needle, the syringe (24) without needle being releasably removable from the sliding joint (22) after fluid coupling with the vial (14) through the passageway (56) of the sliding joint (22), without removal of the sliding joint (22) from the connector (18). The device (10) may be supplied only as the connector (18) with the sliding joint (22).

[0008] In another form, the syringe safety device (10) is further characterized by the connector (18) enclosing a conventional syringe needle (20) with one pointed end (20a) and one enlarged, blunt mounting end (20b) mounted to the first axial end (22a) of the sliding joint (22) and the needle (20) being non-releasably captured in the connector (18) with the sliding joint (22) whereby the device (10) includes at least the connector (18) with the needle (20) and the sliding joint (22).

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0009] The following detailed description of the preferred embodiment of the invention will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, there is shown in the drawings an embodiment which is presently preferred. It is understood, however, that the invention is not limited to the precise arrangement and instrumentality shown. In the drawings:

Fig. 1 is a perspective, partially exploded view of a syringe safety device of the present invention;
Fig. 2 is a perspective view of the device of Fig. 1 in an assembled state before use;
Fig. 3 is a perspective of the assembly after use with the syringe removed;
Fig. 4 is a side elevation view of the syringe safety device of Fig. 2 coupled with and between a conventional medicine vial with stopper and a conventional syringe with removable needle removed;
Fig. 5 is an axial cross-sectional view taken along lines 5-5 in Fig. 4 before use;
Fig. 6 is an axial cross-sectional view of the assembly of Figs. 4-5 during use;
Fig. 7 is an axial cross section of the tubular connector of the device taken along the lines 7-7 in Fig. 1;
Fig. 8 is an axial cross-sectional view of the needle of the device; and
Fig. 9 is an axial cross-sectional view of the slide joint of the device.

DETAILED DESCRIPTION OF THE INVENTION

[0010] Certain terminology is used in the following description for convenience only and is not limiting. The words "right," "left," "lower" and "upper" designate directions in the drawings to which reference is made. The words "inwardly" and "outwardly" refer to directions toward and away from, respectively, the geometric center of the syringe safety device and designated parts thereof. The terminology includes the words above specifically mentioned, derivatives thereof, and words of similar import.

[0011] Referring to the drawings in detail wherein like numerals represent like elements throughout, Figs. 1-6 illustrate a syringe safety device according to the present invention, generally designated at 10. Briefly stated, the syringe safety device 10 of the present invention allows a user to reconstitute medicine, or withdraw fluid from a stoppered vial 12, without exposing the user to any potential needle sticks. The syringe safety device 10 allows a user to inject the contents of a syringe 24 without needle into a vial 12 for mixture with another material contained in the vial. Once the contents of the vial 12 are mixed and ready for use, a plunger 26 is partially withdrawn from the barrel 27 of the syringe 24 causing the contents of the vial 12 to be drawn through the device 10 into the syringe 24. The syringe 24 containing the desired amount of mixed medication can be disengaged from the syringe safety device 10 without removing a needle 20 from the syringe safety device 10 (Fig. 3). Then, a needle receiver 30 on a distal end 32 of the syringe 24 can be attached to a mating part on a catheter or other tube or on an intravenous bottle or bag or the like (none shown) to transfer the contents of the syringe 24 into a patient. During the entire use of the syringe safety device 10, the user is not exposed to the needle 20 it contains.

[0012] The syringe safety device 10 is shown in the various Figs. 1-6 and is primarily formed by a preferably, but not necessarily, generally cylindrically shaped generally tubular connector 18 having first and second opposing open ends 18a, 18b. A first open end 18a of the connector 18 is preferably configured to attach to a sealed vial 12 (Figs. 3-6). An opposing, second open end 18b of the connector 18 is preferably configured to releasably receive the syringe without needle 24 (Figs 4-6). The connector 18 is preferably formed from dura-

ble, high strength material, such as polycarbonate or the like. An elongated circumferential flange 64 defines a pair of radially outwardly projecting finger grips 64a, 64b but a circular circumferential flange or a pair of opposed individual flanges or a separate member (none depicted) on the connector 18 or the like can be provided to assist in using the connector 18 as will be subsequently explained.

[0013] More particularly, referring to Fig. 7, the first and second opposing open ends 18a, 18b, respectively of the connector 18, have respective first and second open ended cavities 36 and 46, respectively. The open ended cavities 36, 46 are aligned and in fluid connection and communication with one another, preferably through a central passageway indicated generally at 66, along an axis 10a, which is a central longitudinal axis of the device 10 and each of its components including connector 18. The first open cavity 36 is sized and shaped to receive a stopper end 14a of the vial 14 as best seen in Figs 4-6. The connector 18 further including at least one and, preferably a plurality of integral, spring clip members or "fingers" 29 and 48 located proximal the first end 18a and second end 18b, respectively, which are configured to secure the stopper end of the vial 12 in the first cavity 36 and non-releasably retain the remaining components of the device 10 in the connector 18.

[0014] The remaining components of the device 10 include a cannula, preferably in the form of a conventional, removable syringe needle 20, and a sliding joint 22. The needle 20 and sliding joint 22 are shown assembled in Fig. 1 and assembled with the tubular connector 18 in Figs. 2-6. They are shown individually in Figs 8 and 9, respectively. When device 10 is assembled, the needle 20 is generally axially oriented in the connector 18, in the central passageway 66 and the second cavity 46. Referring to Fig. 8, the needle 20 has opposing longitudinal ends, a first pointed end 20a which faces the first end 18a of the connector 18 when the device 10 is assembled, and a second, enlarged blunt mounting end 20b. Suggestedly, the needle 20 is a conventional, syringe needle designed for removable mounting by threads, friction, lugs, etc. to a conventional syringe. Preferably, the blunt mounting end of the needle 20 has the bell shaped mating member 21 with a generally tapered inner bore 21a and radially outwardly flared circumferential flange 21b of a removable syringe needle capable of releasably mating with a conventional Luer type needle receiver.

[0015] As best seen in Fig. 9, the sliding joint 22 has first and second opposing axial ends 22a and 22b, respectively. When assembled with the needle 20, the first axial end 22a is engaged preferably releasably engaged with the blunt mounting end 20b of the needle 20 (see Figs. 1 and 4-6) to move the needle 20 with the sliding joint 22 in the second cavity 46 and in the passageway 66 into the first cavity 36 (Fig. 6). The sliding joint 22 is configured to form a leak resistant fluid coupling between the blunt mounting end 20b of the needle 20 and the sliding joint 22. Preferably, the first axial end 22a of the sliding joint 22 includes conventional removable syringe needle receiver or mount like that found on a conventional syringe to removably receive a syringe needle and indicated generally at 50, to releasably engage the blunt mounting end 20b of needle 20. In particular, sliding joint 22 is shown with a Luer type removable needle receiver or mount 50 having a central spout 50a with tapered outer side wall and surrounding concentric collar 50b having internal threads 51, which threadingly engage the outwardly flared flange 21b at the blunt mounting end 20b of the needle 20. Alternatively, the collar 50b can be eliminated and spout 50a tapered to frictionally engage the tapered inner bore 21a of the mating member 21 as the sole mount. Also the needle mount of the sliding joint 22 can be molded with one or more integral clip members (not depicted) to snap over the radial flange 21a. In the alternative, a bayonet releasable fitting or any other conventional releasable syringe needle receiver can be duplicated on end 22a to releasably engage a matingly configured syringe needle. Finally, a syringe needle can be non-removably joined to the sliding joint 22 by being molded into the sliding joint 22 or heat or sonic or solvent welded to a suitable receiver structure on or in the joint, depending upon the material of the joint and construction of the needle. The needle should have an enlarged blunt end 20b which will prevent the needle from slipping through or past the sliding joint 22 no matter how hard the sliding joint 22 is pressed against the needle 20 in using device 10.

[0016] The second axial end 22b of the sliding joint 22 is open and has an inner chamber 54 exposed at the second end 18b of the connector 18 (see Figs. 1-3) and the device 10. The inner chamber 54 is configured to releasably receive at least the needle mount or receiver 30 of the barrel 27 of the syringe 24 and to also form a leak resistant fluid coupling with the needle mount 30 such that the sliding joint 22 forms a leak resistant fluid connection between the needle 20 and the syringe 24, when all three are assembled as shown in Figs. 4-6. Specifically, the inner chamber 54 is provided with a needle receiver coupling in the form of a central tubular projection 55 having a generally cylindrical outer sidewall and a generally inwardly tapering inner sidewall designed to extend between and releasably engage the central spout portion 30a and surrounding internally threaded collar 30b (see Figs. 5-6) of a conventional Luer type needle receiver 30 at the distal end 32 of the syringe 24 (see Fig. 3). Passageway 56 extends through projection 55 and spout 50a.

[0017] Still referring to Fig. 9, the chamber 54 preferably includes a plurality of circumferentially and radially inwardly projecting ribs 58, which are preferably circumferentially aligned proximal the open end of chamber 54 to support and preferably lightly frictionally grip the barrel 27 of syringe 24. The sliding joint 22 further includes at least two stop members on its outer circumferential

surface preferably in the form of first and second spaced apart circumferential, radially outwardly projecting shoulders 61 and 62. Shoulder 61 preferably includes a generally slopping surface 61 a, 62a facing passageway 66 and a generally radially extending surface 61b, 62b facing rib 63 and the second end 22b of the sliding joint 22 to non-releasably slidably retain sliding joint 22 in the second cavity. The sliding joint 22 further preferably includes a plurality of circumferentially spaced, axially and radially outwardly projecting ribs 63, which are located most proximal to end 22b (Figs. 1-2). Each rib 63 has a sloping inner side 63a facing shoulders 61, 62.

[0018] The first open end 18a of the connector 18 is configured to be secured over the top of the vial 12 and its stopper 14 by being defined by a transverse end wall 41 of the tubular connector 18 that extends generally radially outwardly, relative to the adjoining portion of the connector 18 defining passageway 66 and a sidewall 34 that extends generally axially from the end wall 41 to form the generally cylindrical first cavity 36. In Fig. 5, first cavity 36 includes an inner cavity portion indicated generally at 36a, which snuggly receives the flange 13, stopper 14 and seal 16 of vial 12, and a outer cavity portion 36b which has a larger diameter to more easily receive the vial 12 and guide it to the inner portion 36a. In Figs. 1-3 and 7, generally U-shaped slots 35 break the sidewall 34 of the connector 18 defining the first cavity 36 into one or more individual spring clip members or "fingers" 38, which are integral with the connector 18. In Fig. 7, the distal ends of the clip members 38 curve generally radially inwardly and then outwardly to define a necked region 39 of the member 38 and a flared inner surface 40 at the extreme distal end of member 38, which allows the vial 12 with stopper 14 to be inserted into the first cavity 36 at the first end 18a of the connector 18 and, more particularly, into the inner portion 36a of cavity 36, by spreading the fingers 38 with the top of the vial 12 to expand a necked region 39. The spring clip fingers 38 bias the stopper 14 of the vial 12 against the interior transverse wall 41 of the connector 18, which defines the inner extent of the first cavity 36. An annular projection 42 extends axially outwardly from the interior transverse wall 41 of the connector 18 toward the vial 12 and provides a tight seal between the connector 18 and a portion of the stopper 14 surrounding a needle injection site at the center of the stopper 14. Preferably, diametrically opposed bosses 37 project inwardly from the sidewall 34 in the outer cavity portion 36a between fingers 38 to limit the degree the vial 12 can be twisted side to side in cavity 36. While individual fingers 38 are formed within the sidewall of the connector 18, it will be appreciated that the fingers 38 might be extended to the distal end of the sidewall and cavity 36. However, the cantilever fingers 38 disclosed, which are surrounded on all sides by non-movable portions of the connector 18, make removal of the vial 12 from the connector 18 difficult and make accidental removal nearly impossible.

[0019] In Fig. 7, the second cavity 46 and passageway 66 take up the remainder of the length of the connector 18. A first end 66a of the passageway 66, which is most proximal the first end 18a, extends to the interior transverse wall 41. The passageway 66 includes a central opening 43 through wall 41. The opening 43 is effectively sealed by the stopper 14 of a vial 12 secured in the cavity 36. A second end 66b of the passageway 66 extends to a circumferential shoulder 28 of the connector 18 which defines an innermost extent of the second cavity 46. The second end 66b of the passageway 66 is preferably sealed by the combination of the sliding joint 22 and the syringe 24. The inner surface 69 of the passageway 66 is preferably inwardly tapered as the surface moves axially from the second end 18b toward the first end 18a of the connector 18 to provide a shield for the distal (pointed) end 20b of the needle 20 when the needle 20 is displaced within the connector 18. Preferably, connector 18 can include a plurality of ribs 70 which project radially outwardly from a conical sidewall 71 defining passageway 66 and extend axially between end wall 41 and shoulder 28 to strengthen the connector 18 between the cavities 36, 46.

[0020] The second open ended cavity 46 is defined by a second, generally cylindrically shaped sidewall 44 of connector 18, which extends axially away from shoulder 28 to the second end 18b. Preferably, one or more generally U-shaped slots 47 in the sidewall 44 form one or more of the spring clip members or fingers 48. Preferably, fingers 48 are integrally molded as part of the connector 18 and slope radially inwardly into the cavity 46 as the fingers 48 extend axially from their connection with the remainder of the connector 18 towards the first end 18a of the connector. The shoulders 61, 62 are sized and spaced such that the sliding joint 22 is inserted until the first shoulder 61 cams completely under the fingers 48 (Figs. 4 and 5). The sliding joint 22 is then captured by interference between fingers 48 and radial surface 61b of shoulder 61. This is the first stop position shown in Fig. 5. The sliding joint 22 and needle 20 can be slid further into the connector 18 and back to the first stop position until the second shoulder 62 cams fully under fingers 48 (Fig. 6). This is the second stop position. Preferably at the second stop position, the inner end 22a of sliding joint 22 abuts against shoulder 28. Ribs 63 also deflect the outer end of sidewall 44 proximal end 18b radially outwardly to bias the ends of fingers 48 harder against sliding joint 22 making outward deflection of fingers 48 more difficult and sliding joint 22 non-removable from the connector 18. While it is preferable that the sliding joint 22 has a generally cylindrical shape, those of ordinary skill in the art will appreciate from this disclosure that the sliding joint 22 can have a circumferential outer surface with any shape which is complementary to the inner surface of the second cavity 46 within which the sliding joint 22 moves.

[0021] The syringe safety device 10 preferably operates as follows. The connector 18 is preferably preassembled with the needle 20 attached to the receiver 50

of slide sliding joint 22 as shown in Fig. 1 and the sliding joint 22 and needle 20 inserted into the connector (Fig. 2). The axial ends 18a, 18b of the connector 18 can be sealed before use by suitable means, such as peel away foils 72a, 72b (phantom in Fig. 2) or other removable cover(s), or supplied in a sealed package such as a blister pack (not depicted) for sterility. After the device 10 is removed from its packaging and/or any end cover(s) removed, the first end 18a of the connector 18 is snapped over the top of a stopper sealed vial 12 as shown in Figs. 3-6. The distal end 32 of syringe 24 is then inserted into the sliding joint 22 (Fig. 2) sufficiently into the chamber 54 to create a tight connection between the needle receiver or mount 30 of the syringe 24 and the needle receiver coupling 55 of the sliding joint 22 as shown in Fig. 4. The sliding joint 22 is retained in the second end 18b of the connector 18 by engagement of the fingers 48 of the connector 18 with rib 61. A user can grip finger grips 64a, 64b to displace the sliding joint 22 generally radially inwardly to cause the needle 20 on the sliding joint 22 to perforate the stopper 14. It may be desirable to inwardly taper the sidewall 44 of the second cavity 46 slightly to provide some resistance to the inward movement of the sliding joint 22.

[0022] As the sliding joint 22 moves inwardly, the pointed tip 20a of needle 20 passes through opening 43, annular projection 42 and the stopper 14 and into the vial 12 to place the syringe 24 in fluid communication with the interior of the vial 12 as shown in Fig. 6. Then, the user depresses the plunger 26 to empty any contents of the syringe barrel 27 into the vial 12. The vial 12 and the syringe safety device 10 are then shaken to mix the fluid from the syringe 24 with the contents of the vial 12. After the mixture is ready for use, the plunger 26 is partially withdrawn from the barrel 27 of the syringe 24 to cause the mixture in the vial 12 to be drawn into the syringe 24. After a desired amount of the mixture is drawn into the syringe 24, the syringe 24 can be detached from the syringe safety device 10 (Fig. 3) without removing the needle 20 from the syringe safety device 10. The syringe 24 can then be attached via the needle receiver/mount 30 to a catheter or other tube or an intravenous bottle or bag or the like with a matingly configured conventional removable syringe connection (not depicted).

[0023] While the preferred embodiment of the syringe safety device 10 uses a connector 18 that is a separate component from the vial 12 and syringe 24, those of ordinary skill in the art will appreciate from this disclosure, that the connector 18 can be manufactured as an integral part of the vial 12 or syringe 24 (or both) without departing from the scope of the present invention. Also, the connector can be supplied coupled with a vial 14 with medication or a syringe 24 with fluid or both in a sterile sealed package. Also, it will be appreciated that a septum, which could be penetrated by needle 20, can be positioned at the transverse wall 41 to seal the needle 20 in the connector, if desired. Such septum could itself be provided with an annular projection like 42.

[0024] It is recognized by those of ordinary skilled in the art, that changes could be made to the embodiment of the invention without departing from the broad inventive concept thereof. It is understood, therefore, that this invention is not limited to the particular embodiment disclosed, but it is intended to cover all modifications which are within the spirit and scope of the present invention as defined by the appended claims.

Claims

1. A syringe safety device (10) configured to form a fluid coupling between a sealed vial (14) and a syringe (24), the syringe safety device (10) including a tubular connector (18) having a first axial open end (18a) configured to engage the end of a conventional medicine vial (12) with stopper (14) and a second, opposing open axial end (18b) adapted to releasably receive a conventional syringe for sliding movement of the syringe in the tubular connector (18) towards and away from the vial (12), **characterized in** the tubular member (18) enclosing a sliding joint (22) having opposing first and second axial ends (22a, 22b),and a passageway (56) between the first and second ends (22a, 22b), the first axial end (22a) being configured to engage with an enlarged, blunt mounting end (20b) of a syringe needle (20), the second axial end (22b) of the sliding joint (22) further being configured to releasably engage at least a releasable needle receiver (30) on a distal end (32) of a barrel (27) of a conventional syringe (24) without needle, the syringe (24) without needle being releasably removable from the sliding joint (22) after fluid coupling with the vial (14) through the passageway (56) of the sliding joint (22), without removal of the sliding joint (22) from the connector (18).

2. The syringe safety device according to claim 1 further **characterized by** the connector (18) enclosing a conventional syringe needle (20) with one pointed end (20a) and one enlarged, blunt mounting end (20b) and the needle (20) being non-releasably captured in the connector (18) with the sliding joint (22).

3. The syringe safety device according to claim 2 further **characterized by** sliding joint (22) being slidably mounted in the connector (18) and the first axial end (22a) being engaged with the blunt mounting end (20b) of the enclosed needle (20) to support and axially move the needle (20) with the sliding joint (22) in the connector (18) and to form a leak resistant fluid coupling between the blunt mounting end (20b) of the needle (20) and the sliding joint (22).

4. The syringe safety device (10) according to claim 1 further **characterized by** the first axial end (22a) of the sliding joint (22) being configured to releasably mate with the blunt mounting end (20b) of the enclosed needle (20).

5. The syringe safety device (10) according to claim 4 further **characterized by** the first axial end of the sliding joint (22) including a needle receiver (50) configured to releasably engage the blunt mounting end (20a) of the enclosed needle (20).

6. The syringe safety device (10) according to claim 4 further **characterized by** the first axial end (22a) of the sliding joint (22) including threads (51) configured to releasably engage the blunt mounting end of the enclosed needle (20).

7. The syringe safety device according to claim 1 further **characterized by** the second axial end (22b) of the sliding joint (22) being open and having an inner chamber (54) exposed at the second end (18b) of the connector (18), the inner chamber (54) being configured to releasably receive at least a needle mount (30) provided on the distal end (32) of the syringe (24) to removably mount a needle to the distal end (32) of the syringe (24).

8. The syringe safety device (10) according to claim 7 further **characterized by** the inner chamber (54) of the sliding joint (22) having a tapered central opening (56a) forming part of the passageway (56) and configured to releasably frictionally engage the needle mount (30) of the syringe (24).

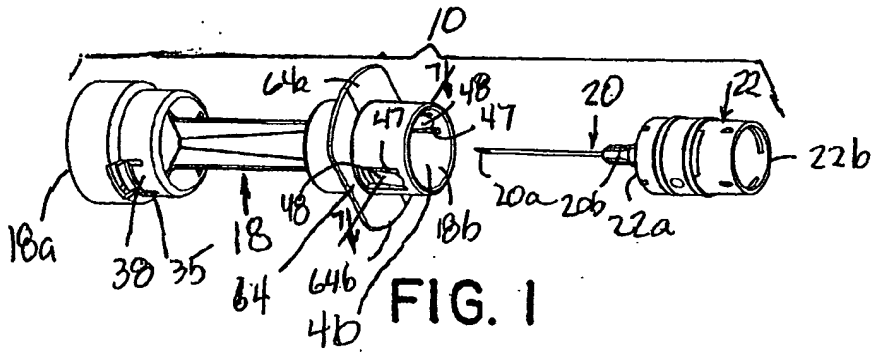
9. The syringe safety device (10) according to claim 7 further **characterized by** inner chamber (54) of the sliding joint (22) having a structure (55) configured to releasably threadingly mate with the needle mount (30) of the syringe (24).

10. The syringe safety device (10) according to claim 2 further **characterized by** the connector (18) having first and second open ended cavities (36, 46) at the first and second open axial ends (18a, 18b) and a central passageway (66) fluidly connecting the first and second cavities (36, 46), the central passageway (66) tapering radially inwardly in extending from the second cavity (46) toward the first cavity (36) sufficiently to engage the blunt end (20b) of the needle (20) to retain the needle within the connector (18) with the sliding joint (22).

11. The syringe safety device (10) according to claim 10 further **characterized by** the first cavity (36) including an interior transverse wall (41) and the passageway (66) including a central opening (43) through the transverse wall (41) and by an annular protuberance (53) projecting axially outwardly toward the first open end (18a) from the transverse wall (41) and surrounding the opening (43) sufficiently to seal against the stopper (14) of a vial (12) secured in the first cavity (36).

12. The syringe safety device (10) according to claim 1 further **characterized by** the sliding joint (22) having a needle receiver (50) at the first axial end (22a) configured to engage with the enlarged blunt end (20b) of the needle (20) and a needle receiver engaging structure (55) located at the second axial end (22b) configured to releasably receive the needle receiver (30) of the syringe (24).

13. The syringe safety device of claim 12 further **characterized by** the needle receiver (50) at the first end (22a) being configured for releasable mating with the needle receiver engaging structure (55) at the second end (22b) whereby the sliding joint (22) can be releasably engaged between a releasable syringe needle (20) and a syringe (24) directly releasably engageable with the syringe needle (20).


10
64a
48
47
47
20
22
22b
18a
18
48
18b
20a
20b
22a
38
35
64
64b
46
FIG. 1

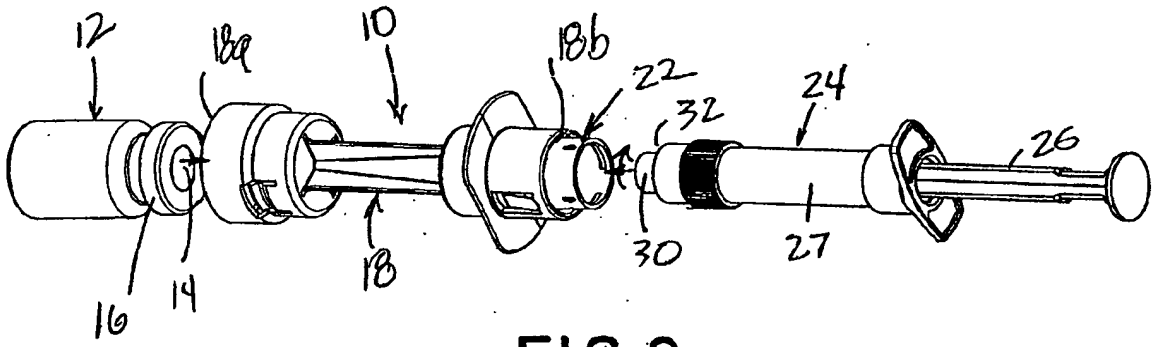

12
18a
10
18b
22
32
24
26
16
14
18
30
27

FIG. 2

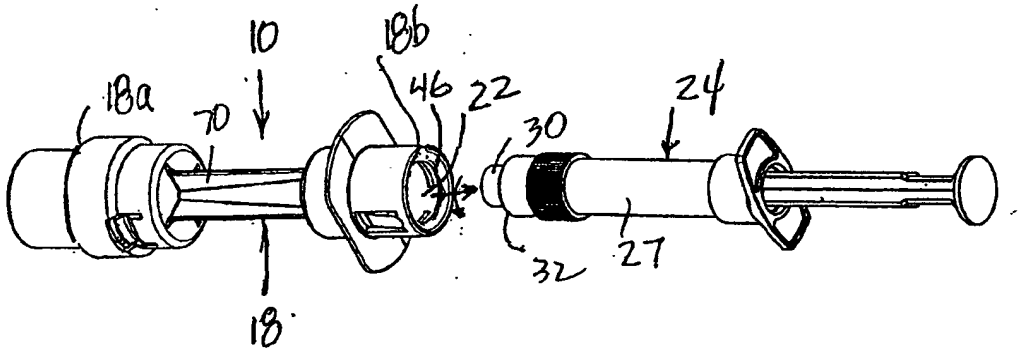

10
18b
18a
70
46
22
30
24
18
32
27

FIG. 3

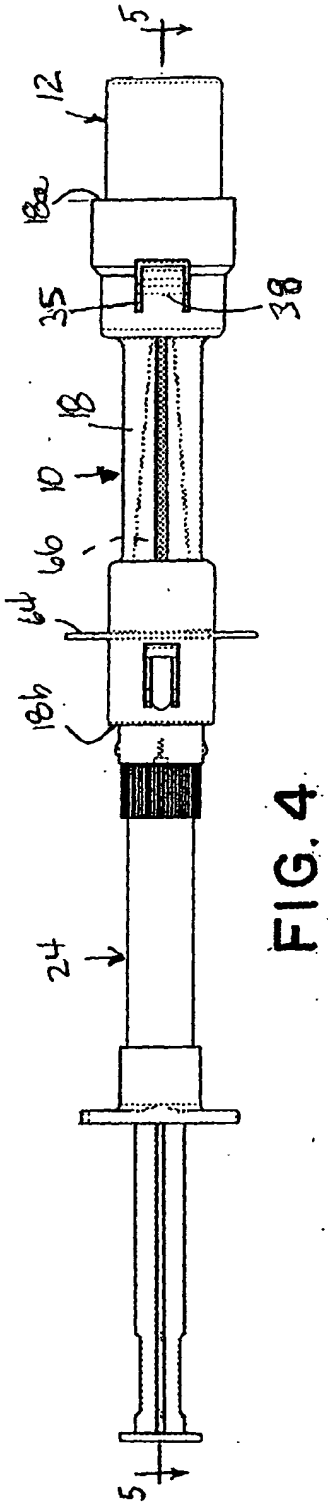


FIG. 4

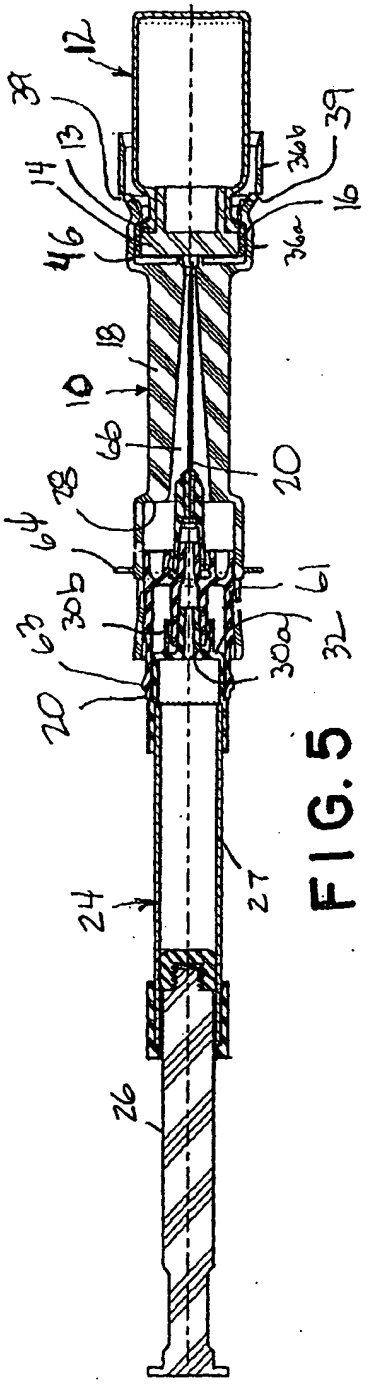


FIG. 5

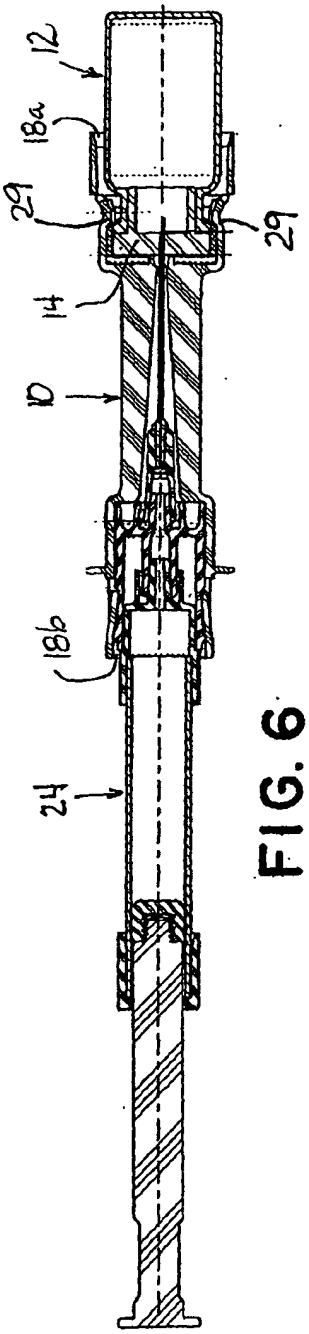


FIG. 6

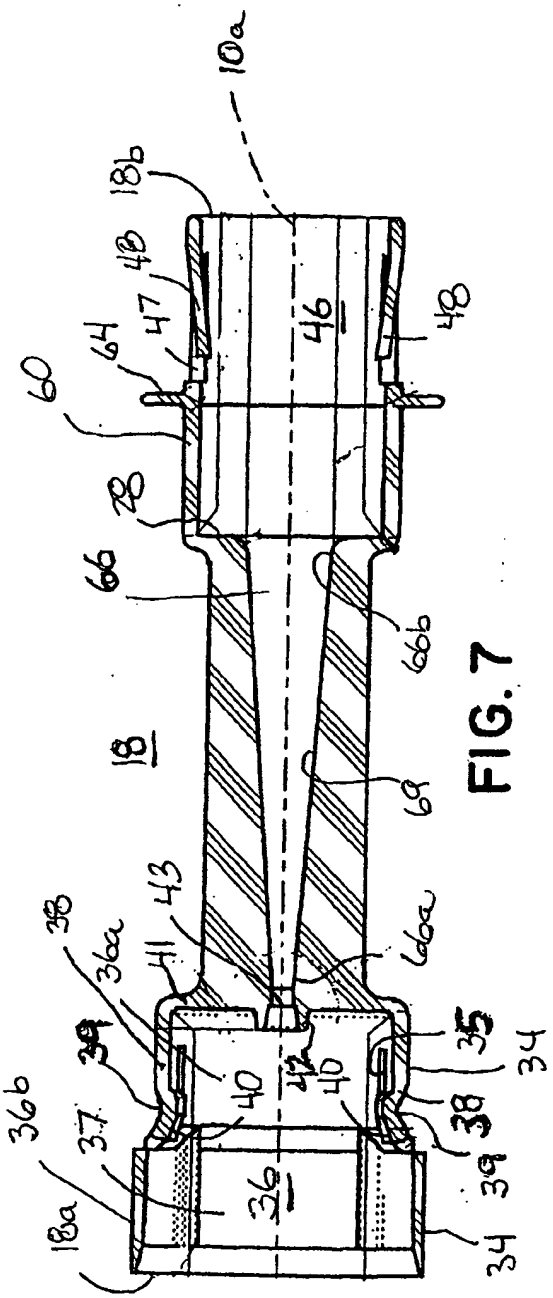


FIG. 7

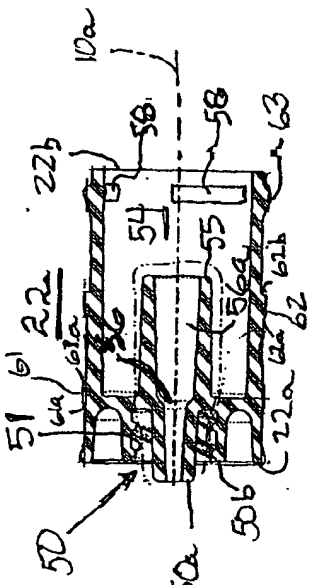


FIG. 9

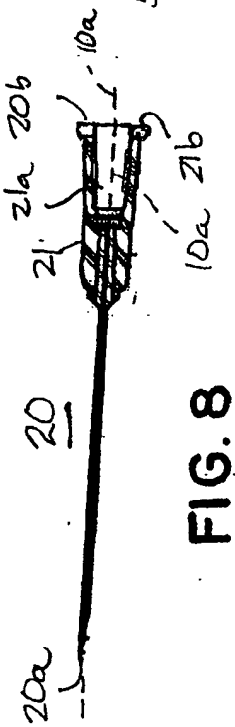


FIG. 8